CLAIMS

1 – Mechanical part made of steel deriving from the hot forge or the cold press, of medium or small size, and resulting from plastic transformation of a long siderurgical semiproduct, characterized in that the steel of which it is composed has a composition that, besides iron and the inevitable residual impurities resulting from processing of the steel, corresponds at least to the following analysis, given in weight percentages:

0.2	≤	C	≤	0.5
0.5	≤	Mn	≤	2.0
0.05	≤	V	≤	0.5
0.6	≤	Si	≤	1.5
0.05	≤	Cr	≤	1.0
0.01	≤	Mo	≤	0.5
0.02	≤	S	≤	0.10

and possibly up to 50 ppm of boron

and in that the said part is obtained from a long semiproduct deriving from continuous casting and hot-rolled in the austenitic area, then formed by plastic deformation and treated thermally in order to obtain a metallographic structure containing essentially acicular ferrite at least in the zones of mechanical stressing in tenacity and fatigue.

2 – Mechanical part according to claim 1, characterized in that the steel which constitutes it furthermore contains from 0.01 to 0.02% titanium and/or up to 0.20% aluminum.

3 – Mechanical part according to claim 1 or 2, characterized in that the steel which constitutes it furthermore comprises between 5 and 30 ppm of calcium.

4 – Steel for the manufacture of a mechanical part by plastic deformation, characterized in that, besides the inevitable residual impurities resulting from processing of the steel, its chemical composition comprises at least, expressed in weight content:

0.2	≤	C	≤	0.5
0.5	≤	Mn	≤	2.0
0.05	≤	V	≤	0.5
0.6	≤	Si	≤	1.5
0.05	≤	Cr	≤	1.0
0.01	≤	Mo	≤	0.5
0.02	≤	S	≤	0.10

and possibly up to 50 ppm of B

and in that the metallographic microstructure that it will have, once the said part is implemented, is essentially composed of acicular ferrite at least in the zones of the part subjected to mechanical stressing in tenacity and fatigue.

5 – Steel according to claim 5 or 6, characterized in that , in order to protect the vanadium, it furthermore contains from 0.01 to 0.02 % titanium and/or up to 0.20% aluminum.

6 – Steel according to claim 4 or 5, characterized in that it furthermore comprises between 5 and 30 ppm of calcium.

7 – Process for manufacture of a mechanical part made of steel, characterized in that, for the purpose of obtaining acicular ferrite at least locally on the said part, it comprises the following stages:

- there is provided a continuous casting billet made of steel with a composition according to the analysis given hereinabove, which is hot-rolled at a temperature in excess of 1000° C into a bar or wire before being cooled to room temperature after rolling;
- the wire being subjected to a controlled cooling prior to its formation into rings for the obtaining of a metallographic structure composed essentially of acicular ferrite, which wire then is cut into pieces and cold-pressed into a finished part ready for use;
- the bar itself being cooled naturally in the rolling heat prior to its cutting into pieces which then are hot-forged into a rough shape of a part that is cooled by controlled cooling for obtaining of a structure essentially composed of acicular ferrite at least in the stressed zones of the part, which rough shape then is machined, as need be, to the desired dimensions to make it into a finished part ready for use.

8 – Process according to claim 7, characterized in that the controlled cooling is a natural cooling to room temperature.

9 – Process according to claim 7, characterized in that the controlled cooling is a forced cooling ensuring a surface cooling speed of approximately 0.5 to 15° C/s.

10 – Long, medium carbon siderurgical semiproduct, intended to be transformed by forge or by press into a mechanical part with high characteristics, of small size or of medium size, characterized in that in order that the said part may have a metallographic microstructure essentially composed of acicular ferrite at least in the zones of the part subjected to mechanical stressing in tenacity and fatigue, the steel that constitutes it corresponds at least to the following analysis, given in weight percentages:

$$0.2 \leq C \leq 0.5$$

0.5	≤	Mn	≤	2.0
0.05	≤	V	≤	0.5
0.6	≤	Si	≤	1.5
0.05	≤	Cr	≤	1.0
0.01	≤	Mo	≤	0.5
0.02	≤	S	≤	0.10

and possibly up to 50 ppm of boron

and in that the metallographic microstructure that it will have after transformation will be essentially composed of acicular ferrite at least in the zones of the part subjected to mechanical stressing in tenacity and fatigue.